PB-216 934

NATIONAL ESTUARINE POLLUTION STUDY PRELIMINARY REPORT, NORTHEAST REGION

Federal Water Pollution Control Administration
Metuchen, New Jersey

January 1968

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PB 216 934

NATIONAL ESTUARINE POLLUTION STUDY

Preliminary Report

NORTHEAST REGION

U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
NORTHEAST REGION
NORTH ATLANTIC WATER QUALITY MANAGEMENT CENTER
Metuchen, New Jersey
JANUARY 1968

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PRELIMINARY REPORT

NORTHEAST REGION

U. S. Department of the Interior
Federal Water Pollution Control Administration
Northeast Region
North Atlantic Water Quality Management Center
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National Estuarine Pollution Study - Preliminary Report

Northeast Region (January 1968)

Introduction

The Clean Water Restoration Act of 1966 amended the existing Federal Water Pollution Control Act by directing the Secretary of the Interior to conduct a National Estuarine Pollution Study and present a report to the Congress in November 1969. To assist the Secretary in the preparation of this report to Congress, this preliminary report has been prepared to summarize certain readily available background information on estuarine conditions and prospects in the Northeast Region (which contains the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey and Delaware). With the exception of Vermont, all of the States in the Region have estuarine areas. Some information on Pennsylvania is also provided here because of Philadelphia's importance to the Delaware estuary, but the Middle Atlantic Region's report should be consulted for a complete discussion.

All of the States in the Northeast Region were asked to submit preliminary policy statements outlining some of their views of the role the federal government should have in matters of estuarine pollution, indicating areas of desirable national legislation which would support or supplement their state programs, and registering their aversion to any types of legislation they felt to be particularly undesirable. Their responses are given in Appendix A.

Background Information

The following background data on the coasts and estuaries in the Northeast Region have been summarized from Federal Water Pollution Control Administration Immediate Needs and other Reports, State classification and other reports, Interstate Agency classification reports, and other published information. Appendix B presents the organization of information on the region's estuaries.

Seven of the Northeast Region's major ports were among the top 24 in the nation in 1964 (Table I). The Port of New York (the country's largest) shipped over 149 million tons, more than the next seven largest ports in the region combined. Ninety-five percent of the 157 million tons handled by the five ports on the Hudson estuary was shipped from the Port of New York at the estuary's mouth. By contrast, the seven ports on the Delaware estuary handled over 104 million tons, but the most seaward of these ports is over 60 miles from the ocean. The largest port in each state is Portland, Maine; Portsmouth, New Hampshire; Boston, Massachusetts; Providence, Rhode Island; the Port of New York, New York and New Jersey (Paulsboro is New Jersey's next largest); and New Castle, Delaware. The U. S. Navy maintains bases at Portsmouth, Boston, New London, New York and Philadelphia.

The chief industrial concentrations along tidal waters are in the port areas listed in Table I and at Bangor, Augusta, Bath, Biddeford-Saco, Haverhill, Hartford, Middletown and Derby. Almost all major industries are represented. In general, population density at the coast increases with distance from the

Table I

Ports in the Northeast Region

Tons Shipped in 1964

Major Ports

National Rank	Port	Tons (2,000 lbs.)
1)	Port of New York, N. Y. & N. J.	149,150,611
5)	Philadelphia, Penna.	47,041,734
12)	Boston, Mass.	20,011,441
14)	Portland, Me.	18,830,314
16)	Paulsboro, N. J.	17,840,530
17)	Marcus Hook, Penna.	17,621,554
24)	New Castle, Del.	12,206,072

Other Ports

	Rockland Harbor, Me.	88,630
	Searsport Harbor, Me.	1,248,574
	Portsmouth Harbor, N. H.	1,460,325
	Burlington Harbor, Vt.*	530,227
	Beverly Harbor, Mass.	163,768
	Fall River Harbor, Mass.	3,161,590
	Gloucester Harbor, Mass.	170,632
	New Bedford, Fairhaven Harbor, Mass.	343,942
	Salem Harbor, Mass.	1,770,866
	Newport Harbor, R. I.	84,092
	Providence River and Harbor, R. I.	8,191,681
	Bridgeport Harbor, Conn.	2,349,442
	New Haven Harbor, Conn.	8,937,201
	New London Harbor, Conn.	813,516
	Norwalk Harbor, Conn.	1,206,970
	Stamford Harbor, Conn.	869,536
	Cold Spring Harbor, N. Y.	285,988
	Hempstead Harbor, N. Y.	3,716,869
	Huntington Harbor, N. Y.	433,163
	Peekskill Harbor, N. Y.	168,314
	Plattsburg, N. Y.*	408,562
	Port Chester Harbor, N. Y.	317,628
	Port Jefferson Harbor, N. Y.	1,826,267
	Port of Albany, N. Y.	7,161,229
	Rondout Harbor, N. Y.	565,861
	Tarrytown Harbor, N. Y.	387,048
	Camden-Gloucester, N. J.	4,992,410
	Trenton Harbor, N. J.	2,397,280
	Wilmington Harbor, Del.	2,223,364

*Ports in Non-Tidal Waters.
Source: The World Almanac, 1967.

Canadian border, reaching local maxima at Boston and Providence before achieving its zenith at New York City. From there, the population declines with distance to the Maryland border. All the coastal regions experience influxes of summer visitors, with maximum densities being reached in the beach areas of Long Island and New Jersey.

The water quality which presently exists or which is required by Federal and state water quality standards either is or will be adequate for fish propagation almost everywhere except in a few industrial and urban areas, and will be adequate for bathing in more than 90 percent of the estuarine and coastal waters. In most of the northeast, coastal land is usually divided among many owners of small holdings. In addition, much of the political power in the state rests with the municipalities, some of which may be dominated by a single large industry which is a major polluter. These two factors, the large number of owners coupled with the economic dependence of many municipalities and citizens upon water polluting industries, complicate the task of protecting the estuary from land use changes and water pollution.

In 1965 commercial fishermen in the Northeast Region received $100 million for their catch, divided evenly between fish and shellfish (Table II). If the destruction of breeding and nursery areas by dredging, sand and gravel mining and the filling of wetlands continues at the present rate, the finfish catch must inevitably decline. The productivity of these shallow estuarine areas may be illustrated by the fact that two Rhode Island salt ponds with a total area of 2,000 acres produced over 215,000 winter flounder in one year, equivalent to one quarter of all flounders caught annually by Rhode Island fishermen. However, Rhode Island has only 45,000 acres of wetlands left; Connecticut 15,000; New York 31,000; and New Jersey 232,000. The latter three states alone have lost over 39,000 acres in the period 1954-1964. The losses may be to "sanitary" fill of "waste" wetland, to the use of material dredged from productive, shallow estuaries as fill for wetlands, to sand and gravel "raids" (often disguised as "navigation improvements" - e.g., a channel 300 feet wide, 30 feet deep and 1½ miles long to bring small boats to a Connecticut marina), and to the construction of "Venice" communities with many little homes on land made from material dredged from the canals separating them. Shellfish are also affected by the physical destruction of their habitat. In addition, one sixth of the region's active bivalve acreage has been closed by pollution (Table III) and only 65% of the 1966 potential bivalve acreage was approved for harvesting.

Table IV gives the average flow and degree of urbanization of the region's major streams. All except the St. Croix may be considered urbanized and all are polluted. Table V lists all of the region's streams which have been gaged by the U. S. Geological Survey.

Maine

Maine, the largest of the New England States, has an area of 33,215 square miles (39th in rank) and a total 1960 population of 969,265 (36th). The total length of its irregular coastline is 3,478 statute miles. The state is noted for its scenic and vacation attractions, lobsters, forest products, and fishing.

The island studded waters to the north of Portland are a boater's paradise, and the beautiful sand beaches to the south of Portland attract thousands

Table II

1965 Commercial Fishery Statistics

(Price paid to the Fisherman in Millions of dollars)

State	Fish*	Shellfish**	Total
Maine	5	17	22
New Hampshire	<0.5	1	1
Massachusetts	31	15	46
Rhode Island	3	2	5
Connecticut	<0.5	1	1
New York	3	9	12
New Jersey	5	7	12
Delaware	1	<0.5	1
	48	52	100

Notes

* Vertebrates, except turtles

** Invertebrates and turtles

Source: Fishery Statistics of the U. S., 1965.
(Bureau of Commercial Fisheries)

Table III

1966 Acreage of Bivalve Mollusc Potential Production Areas

	Active Area		Inactive Area		Total Area
	Approved	Closed	Approved	Closed	
Maine	291,600	60,500	0	800	352,900
New Hampshire	-	-	-	-	-
Massachusetts	31,200	7,900	0	0	39,100
Rhode Island	76,600	19,700	0	0	96,300
Connecticut	48,400	14,500	20,000	0	82,900
New York	403,700	145,400	416,600	18,400	984,100
New Jersey	447,100	57,000	13,500	6,500	524,100
Delaware	209,700	3,400	0	2,800	215,900
	1,508,300	308,400	450,100	28,500	2,295,300

Notes

Active Areas: Interstate and intrastate waters currently growing shellfish.

Inactive Areas: Interstate and intrastate waters not currently growing shellfish but which are biologically capable of producing shellfish.

Approved Areas: Waters which have been approved by the State control agencies for growing and/or harvesting of shellfish for direct marketing; or for which approval is contingent upon the attainment of an established performance standard by sewage treatment works discharging effluent, directly or indirectly, to the area.

Closed Areas: Waters prohibited by the State control agencies for harvesting of shellfish.

Source: National Register of Shellfish Production Areas, 1966
(U. S. Public Health Service)

Table IV

Largest Streams in Northeast Region

Name	Average flow (cfs)*	Degree of Urbanization**	Estuarine Code***
1. Connecticut	18,327	6	NE-35-5
2. Delaware	16,409****	6	NE-37
3. Hudson	15,248	6	NE-36-6-3
4. Penobscot	12,393	4	NE-9-1
5. Merrimack	7,271	5	NE-22-1
6. Kennebec	7,200	4	NE-14-1
7. Androscoggin	6,034	4	NE-14-2
8. Housatonic	3,104	5	NE-35-8
9. Saco	2,471	4	NE-16
10. St. Croix	2,239	2	NE-1-1
11. Thames	2,131	4	NE-35-3
12. Raritan	1,439	5	NE-36-6-6
13. Passaic	1,323	6	NE-36-6-5

Notes

* Source: Surface Water Supply of the United States, 1960 (U. S. Geological Survey)

** See Appendix B-1, Item I, Pg. 3

*** See Appendix B-2

**** Includes the Schuylkill River, which has an average flow of 2,975 cfs.

Table V

Average Stream Flow and Degree of Urbanization

River Name	Stream (Gage Sta.)	Years of Record*	Average Flow* (cfs)	Urban-ization**	Estuarine Code***
St. Croix	(Baileyville)	41	2,239	2	NE-1-1
Dennys	(Dennysville)	5	182	2	NE-1-1-1-1
Machias	(Whitneyville)	47	942	2	NE-3
Narraguagus	(Cherryfield)	12	500	2	NE-5
Union River	West Branch (Amherst)	41	263	2	NE-8
Penobscot			12,393	4	NE-9-1
	Penobscot (West Enfield)	58	11,580		
	Passadumkeag (Lowell)	45	497		
	Kenduskeag (Kenduskeag)	19	316		
Sheepscot	(No. Whitefield)	22	239	2	NE-13
Kennebec			7,200	4	NE-14-1
	Kennebec (Bingham)	32	4,300		
	Carrabassett (North Anson)	39	695		
	Sandy (Mercer)	32	935		
	Sebasticook (Pittsfield)	31	935		
	Cobbosseecontee (Gardiner)	70	335		
Androscoggin	(Auburn)	32	6,034	4	NE-14-2
Royal	(Yarmouth)	11	288	2	NE-15
Presumpscot	(Sebago Lake)	73	633	4	NE-15-1

River Name	Stream (Gage Sta.)	Years of Record*	Average Flow* (cfs)	Urban-ization**	Estuarine Code***
Saco			2,471	4	NE-16
	Saco (Cornish)	44	2,175		
	Little Ossipee (So. Limington)	20	296		
Mousam	(West Kennebunk)	21	182	2	NE-18
Piscataqua			543.6	4	NE-20
	Salmon Falls (South Lebanon)	31	242		
	Oyster (Durham)	26	19.6		
	Lamprey (Newmarket)	26	282		
Merrimack	(Lowell)	37	7,271	5	NE-22-1
Parker	(Byfield)	15	35.5	2	NE-22-2
Ipswich	(Ipswich)	30	200	2	NE-22-2
Mystic			27.4	6	NE-26-1-1-1
	Aberjona (Winchester)	21	27.4		
Charles	(Waltham)	29	377	5	NE-26-1-1-1
Neponset			110.1	5	NE-26-1-1
	Neponset (Norwood)	21	51.8		
	E. Br. Neponset (Canton)	8	58.3		
Westport			13.8	3	NE-33-8
	Adamsville (Adamsville)	20	13.8		
Taunton			551.2	5	NE-34-4-1
	Taunton (State Farm)	31	479		
	Wading (Norton)	35	72.2		

River Name	Stream (Gage Sta.)	Years of Record*	Average Flow* (cfs)	Urban-ization**	Estuarine Code***
Providence			797.2	6	NE-34-4-2
	Blackstone (Woonsocket)	31	727		
	Woonasquatucket (Centerdale)	19	70.2		
Pawtuxet	(Cranston)	20	404	4	NE-34-4-2
Potowomut	(East Greenwich)	20	43.4	3	NE-34-5
Pawcatuck	(Westerly)	20	562	4	NE-35-2
Poquonock			26.8	3	NE-35-3
	Great Brook (Poquonock Bridge)	14	26.8		
Thames			2,131	4	NE-35-3
	Shetucket (Willimantic)	35	711		
	Quinebaug (Jewett City)	42	1,258		
	Yantic (Yantic)	30	162		
Connecticut			18,327.4	6	NE-35-5
	Connecticut (Thompsonville)	32	16,630		
	Scantic (Broad Brook)	32	145		
	Farmington (Rainbow)	32	1,089		
	Park (Hartford)	24	123		
	Hockanum (E. Hartford)	34	118		
	Salmon (E. Hampton)	32	182		
	Eight Mile (North Plain)	23	40.4		

River Name	Stream (Gage Sta.)	Years of Record	Average Flow* (cfs)	Urban-ization**	Estuarine Code***
Menunketesuck	(Clinton)	19	22.3	2	NE-35-5
Quinnipiac	(Wallingford)	30	209	5	NE-35-7
Housatonic			3,104	5	NE-35-8
	Housatonic (Stevenson)	32	2,625		
	Naugatuck (Beacon Falls)	38	479		
Saugatuck	(Westport)	28	143	3	NE-35-10
Blind Brook	(Rye)	16	15.4	3	NE-35-11
Beaver Swamp	(Harrison)	16	6.3	3	NE-35-12
Mamaroneck	(Mamaroneck)	14	31.2	3	NE-35-12
Hutchinson	(Pelham)	16	6.6	4	NE-35-12
Bronx	(Bronxville)	16	39.1	4	NE-36-6
Cedar Swamp	(Glen Cove)	22	7.5	3	NE-35-13
Mill Neck	(Mill Neck)	23	9.8	3	NE-35-14
Cold Spring	(Cold Spring Harbor)	10	3	3	NE-35-14
Nissequogue	(Smithtown)	17	42	3	NE-35-16
Peconic	(Riverhead)	18	35.8	4	NE-35-19-1-1-1-1
Carmans	(Yaphank)	18	24.3	2	NE-36-4
Swan	(E. Patchogue)	14	13.1	3	NE-36-4
Patchogue	(Patchogue)	15	21.3	3	NE-36-4
Connetquot	(Oakdale)	17	40.1	3	NE-36-4
Champlin	(Islip)	12	7.8	3	NE-36-4
Penataquit	(Bay Shore)	15	6.1	3	NE-36-4
Sampawams	(Babylon)	16	9.8	4	NE-36-4
Carlls	(Babylon)	16	28.2	4	NE-36-4

River Name	Stream (Gage Sta.)	Years of Record	Average Flow* (cfs)	Urban-ization**	Estuarine Code***
Santapogue	(Lindenhurst)	13	4.9	4	NE-36-4
Massapequa	(Massapequa)	22	12.3	4	NE-36-4
Wantagh	(Bellmore)	23	10.7	4	NE-36-5-1
East Meadow	(Freeport)	23	17.7	4	NE-36-5-1
Pines	(Malverne)	23	5.7	4	NE-36-5-2
Valley Stream	(Valley Stream)	6	6.8	4	NE-36-5-2
Hudson River			15,248.3	6	NE-36-6-3
	Hudson (Green Island)	14	13,930		
	Poeston Kill (Troy)	37	138		
	Kinderhook (Rossman)	36	472		
	Catskill (Oak Hill)	50	128		
	Wappinger (Wappingers Falls)	32	246		
	Fishkill (Beacon)	16	305		
	Saw Mill (Yonkers)	16	29.3		
Hackensack	(New Milford)	39	123	6	NE-36-6-4
Passaic			1,323.3	6	NE-36-6-5
	Passaic (Little Falls)	63	1,202		
	Saddle (Lodi)	37	97.3		
	Weasel (Clifton)	23	6		
	Second (Belleville)	23	18		

River Name	Stream (Gage Sta.)	Years of Record	Average Flow* (cfs)	Urban-ization**	Estuarine Code***
Elizabeth	(Elizabeth)	39	23	5	NE-36-6
Rahway			69.7	5	NE-36-6
	Rahway (Rahway)	39	45.4		
	Robinsons (Rahway)	21	24.3		
Raritan			1,438.7	5	NE-36-6-6
	Raritan (Bound Brook)	21	1,250		
	Green (Plainfield)	22	12.2		
	Lawrence (Farrington Dam)	33	38.5		
	South (Old Bridge)	21	138		
Navesink			76.3	3	NE-36-7
	Swimming (Red Bank)	38	76.3		
Manasquan	(Squankum)	29	72.1	3	NE-36-7-2
Toms River	(Toms River)	32	209	4	NE-36-8
Mullica			216.8	2	NE-36-9-1
	Batsto (Batsto)	33	129		
	Oswego (Harrisville)	30	87.8		
Absecon	(Absecon)	23	28.2	3	NE-36-9-3
Great Egg Harbor	(Folsom)	35	85.1	2	NE-36-9-4
Maurice	(Norma)	28	172	3	NE-37
Cohansey			2	3	NE-37
	West Branch (Seeley)	9	2		

River Name	Stream (Gage Sta.)	Years of Record	Average Flow* (cfs)	Urban-ization**	Estuarine Code***
Delaware			16,407.2	6	NE-37
	Delaware (Trenton)	48	11,930		
	Assunpink (Trenton)	37	119		
	Crosswicks (Extonville)	19	125		
	Neshaminy (Langhorne)	26	276		
	No. Br. Rancocas (Pemberton)	39	168		
	Schuylkill (Philadelphia)	29	2,975		
	Mantua (Pitman)	20	11.6		
	Chester (Chester)	29	81.6		
	Christina (Coochs Bridge)	17	26.8		
	White Clay (Newark)	20	110		
	Red Clay (Wooddale)	17	64.6		
	Brandywine (Wilmington)	14	466		
	Shellpot (Wilmington)	14	9.4		
	Salem (Woodstown)	18	19.4		
	Alloway (Alloway)	8	24.8		
St. Jones	(Dover)	2	25.1	3	NE-37

River Name	Stream (Gage Sta.)	Years of Record	Average Flow* (cfs)	Urban-ization**	Estuarine Code***
Mispillion			4.36	3	NE-37
	Beaverdam (Houston)	2	4.36		
Broadkill			10.9	3	NE-37
	Sowbridge (Milton)	4	10.9		
Indian			7.39	3	NE-37
	Stockley Br. (Stockley)	17	7.39		

Note

* Source: Surface Water Supply of the United States, 1960 (U. S. Geological Survey)

** See Appendix B-1, Item 1, Pg. 3.

*** See Appendix B-2.

of Canadians and Americans each summer. The spectacular scenery of Acadia National Park, which includes portions of Schoodic Point, Mount Desert Island and Isle au Haut, brings many visitors to the highest seacoast point north of Brazil. Other attractions include a sea food festival, windjammer trips and the Friendship Sloop races. Tourism, both coastal and inland, is a $300,000,000 a year industry (ranking second to finished forest products of about double that value). Farm income is about equal to tourism. The fish and shellfish catch is next, valued at over $20,000,000 annually. Maine produces 75 percent of the nation's lobsters and 30 percent of its soft shell clams.

As might be expected from the above, the chief uses of the coastal waters are for recreation, fish propagation and disposal of waste from the pulp and paper industry. Many small sewers dump directly into these waters, but the biggest waste sources are paper mills, fish processing plants and other industries

In the St. Croix River, a large paper company just above the head of tide, and the towns of Calais, Maine and St. Stephen and Milltown, New Brunswick, are the major sources of pollution. The paper company contributes about 95 percent of the river's total BOD load. Hydrogen sulfide odors sometimes emanate from the estuary, toxic pollutants have caused fish kills and shellfish taking is prohibited in places.

Along the coast from the St. Croix to the Kennebec River, the most extensive problems exist near large municipalities where relatively large rivers enter the coastal waters, and in confined bay areas. Industrial operations along the coast generally consist of paper making, food and fish processing, and metal fabricating. Ninety percent of the BOD is contributed by industrial waste discharges, which are the chief causes of degraded water quality from Augusta to the coast in the Kennebec and from Bangor to Bucksport in the Penobscot estuaries, where conditions reach nuisance quality at times. The federal government has held an enforcement conference concerning the Penobscot's pollution. Eastport and Belfast estuarine waters are degraded by food and fish processing plants, as well as by municipal wastes. The waters of Ellsworth, Boothbay and Wiscasset are degraded by municipal wastes.

In its upper reaches the Androscoggin River is polluted by wastes from the wood and paper industries and from municipalities to such an extent that shellfish may not be harvested in Merrymeeting Bay.

The Presumpscot River estuary is the most seriously degraded portion of Casco Bay, primarily due to paper company wastes introduced at Westbrook and also to additional untreated wastes from Westbrook, Portland and Falmouth. Shellfish areas have also been closed because of untreated wastes from Yarmouth, West Bath, Brunswick and Phippsburg.

A tannery, another manufacturer and the City of Saco discharge wastes which significantly degrade the Saco River estuary.

Untreated wastes from Portland and South Portland and from the resort communities of Ogunquit, Old Orchard Beach and Scarboro have degraded quality of the southern coastal waters.

New Hampshire

New Hampshire, with 9,304 square miles and 606,921 persons (1960), ranks 44th and 45th, respectively. Its total shoreline length is 131 statute miles. The tourist-recreation business contributes the second largest amount to the state's economy but, owing to the small coastal area, this is derived chiefly from the lakes and mountains of the interior. Many summer visitors are also attracted to the sand beaches.

Although the Piscataqua River estuary is sufficiently polluted by municipal wastes to preclude shellfishing, the chief pollutants to this estuary are oil, grease, floating solids, color and turbidity from a tannery and from a bleach and dye works.

The degree of pollution in the coastal waters is unknown, but municipal wastes from Hampton and the discharge from the Merrimack River (Massachusetts) may create undesirable conditions.

Massachusetts

Massachusetts, with 8,093 square miles and 5,149,834 persons (1960), ranks 45th and 9th, respectively. The total length of the coastline is 1,519 statute miles. Commercial fish catches total some $40,000,000 annually, almost 1/2 of region total, but manufacturing, recreation and farming are much more important to the state's economy. Massachusetts is fortunate to have many miles of beautiful beaches. Cape Cod is particularly noted, and has been designated a National Seashore. A number of whaling and historical museums also attract many visitors and illuminate the part the sea has played in the colony's growth.

The Merrimack River estuary is grossly polluted by municipal, paper, textile, metal plating, and tannery wastes, and is the subject of a federal enforcement conference.

The tidal portions of the Charles and Neponset Rivers are degraded by municipal and industrial wastes from the metropolitan Boston area. Coastal waters near New Bedford, Fairhaven and Lynn are also degraded. Local discharges affect, to a lesser extent, the waters adjoining the towns of Gloucester, East Gloucester, Rockport, Manchester, Beverly, Marblehead, Swampscot, Nahant and Plymouth. North of Cape Ann, inadequate treatment of wastes from the large summer population results in degradation of the coastal waters.

Rhode Island

Rhode Island, with an area of 1,214 square miles and a population of 859,488 persons (1960), ranks 50th and 39th, respectively. Its total shoreline length is 384 statute miles. Despite the fact that it is densely populated and heavily industrialized ($1,000,000,000 of value added annually), the annual fish and shellfish catch amounts to $3,640,000 and tourism $35,000,000. The beaches attract many summer visitors, and Newport, site of the America Cup races, is world famous.

Portions of Mount Hope Bay are seriously degraded by the municipal wastes from Fall River (Massachusetts) and by textile, rubber and tanning industry wastes discharged into the Fall River. The upper portion of Narragansett Bay

is seriously degraded by municipal and industrial wastes from metropolitan Providence. The Blackstone and Ten-Mile Rivers are the subject of a federal enforcement conference. The lower portion of the bay is degraded to a lesser extent by discharges from Middletown, Newport, Jamestown and Quonset Point.

Connecticut

Connecticut, with an area of 5,009 square miles and a population of 2,535,234 (1960), ranks 48th and 25th, respectively. It has a total shoreline of 618 statute miles. The state economy is dominated by industry, much of which is concentrated in a few urban areas surrounded by belts of suburbs. The southwest coast is also suburban, serving New York City. Much of the rest of the coast is oriented toward the vacation-recreation industry. Long Island Sound is renowned for its many sailboats, and the whaling port of Mystic attracts many visitors.

The Thames estuary is degraded by municipal wastes from Norwich, New London, Groton and the U. S. Navy submarine base at Groton, and by the wastes from 16 industries (paper, chemicals, plastics, and metal working).

The Connecticut River estuary is degraded, to the point where indigenous fish are unable to propagate, by municipal and industrial wastes from the cities of Hartford, Middletown and New Britain, and is the subject of a federal enforcement conference.

The Housatonic River estuary is seriously degraded by municipal and industrial wastes from the Shelton-Derby area, Stratford and the Naugatuck River. The industries present include metal finishing, chemical and dye.

Small areas of New Haven and Branford Harbors are seriously degraded by municipal and industrial discharges. Other portions of these harbors, as well as waters of Milford, Waterford, Mystic and Point Judith Pond, are degraded to a somewhat lesser extent. Much of the Pawcatuck River is also degraded by textile and municipal wastes, resulting in the closing of shellfish areas. The Byram River and the Stamford, Norwalk and Bridgeport harbors are also degraded.

New York

New York, with an area of 49,576 square miles and a population of 16,782,304 (1960), ranks 30th and 1st, respectively. Due largely to Long Island, its total shoreline length is 1,850 statute miles. The state ranks 1st in manufacturing ($19.5 billion value added annually). The Port of New York, which includes berths in New York and New Jersey, handled 28 percent of the nation's foreign trade in 1965. Tourism and business travel amount to $3 billion annually, and livestock and crops almost another billion dollars. Large quantities of oil are shipped via the Port of New York and the Hudson River. New York is fortunate in having beautiful beaches along its oceanfront, particularly Fire Island which has been designated a National Seashore. Long Island Sound and the southern bays are famous for their sailing and boating, while the scenic Hudson Valley, with its Palisades, has been likened to the Rhine.

The New York Harbor complex (including the New Jersey portions), the tidal portions of its tributary streams and bays, and the tidal portion of the

Reproduced from best available copy.

Hudson River are all degraded by municipal and industrial wastes equivalent to more than ten million persons. The single approved shellfish bed is in Sandy Hook Bay (New Jersey). Federal enforcement conferences concerning Raritan Bay and the Hudson estuary have been held.

In Long Island Sound, the Byram and the estuaries to the west of it are all degraded by various wastes as are Little Neck, Manhasset, Oyster, Smithtown and Flanders Bays and Hempstead, Huntington, Northport and Port Jefferson Harbors. Eastern Long Island, which includes Great Peconic, Gardiners Bays and the waters in between, suffers localized degradation from various waste sources. The south shore of Long Island also suffers localized degradation from various waste sources, as well as more extensive degradation in Moriches Bay (which has been the subject of a federal enforcement conference), eastern Great South Bay, Reynolds Channel and parts of Hempstead Bay.

New Jersey

New Jersey, with an area of 8,219 square miles and a population of 6,066,782 (1960), ranks 46th and 8th, respectively. Its tidal shoreline is 1,792 nautical miles long. The state ranks 7th in manufacturing but is first in chemicals production. Its resort industry generates over $2 billion in business annually. In 1965, its fishermen received only $7 million for their shellfish; about one eighth of the state's potentially productive beds have been closed because of pollution. New Jersey is fortunate in having miles of beautiful beaches and miles of protected boating waters inside its bar-built estuaries. Its portion of Delaware Bay is a superb undeveloped resource.

The Shark River estuary is degraded by municipal wastes. The Manasquan River estuary and the Bay Head Canal are degraded by agricultural drainage, septic tank seepage, marinas and recreational boating, and municipal wastes. The Metedeconk River and the Toms River estuaries are degraded by municipal wastes. Great Bay and its tributaries are degraded by septic tank seepage, recreational boating wastes and municipal wastes.

The intracoastal waters from Absecon Inlet to Cape May are of poor quality because of the relatively large volume of municipal wastes discharged to them by 23 plants. Four of these plants are outdated and/or overloaded, particularly in the summer when the vacationing seasonal population is at its peak. In addition, septic tank seepage and recreational boating wastes also contribute to the degradation of these bay waters. The bay and coastal waters from Shark River to Cape May have been the subject of a federal enforcement conference.

Delaware

Delaware, with an area of 2,057 square miles and a population of 446,292 persons (1960), ranks 49th and 46th, respectively. Its total shoreline length is 381 statute miles. Manufacturing is by far the largest item in the state's economy, with chemicals providing almost one third of that segment of income.

The Delaware River estuary, including Delaware Bay, is approximately 135 miles long, covers 4,000 square miles and is surrounded by some 300,000 acres of wetlands. Water quality in the Bay is a superb resource, suitable for all forms of recreation, but its utilization is limited by inadequate points of

access. Commercial fishing, largely limited to the bay, amounts to some $4 million annually.

The estuary, whose head is at Trenton, N. J., includes portions of the states of Delaware, Pennsylvania and New Jersey. The upper portion of the estuary is so polluted by municipal and industrial wastes that it is considered unsafe for swimming, fishing is poor and boating is not aesthetically pleasing. It has been the subject of an extensive federal study.

The Christina River is somewhat degraded by municipal and industrial wastes.

Pennsylvania

Since Pennsylvania is not included in the Northeast Region, mention of this state is confined to a remark that the City of Philadelphia is a major polluter of the Delaware River estuary.

Federal Role

The preliminary views of the eight northeastern states as to the federal government's role in estuarine enhancement and pollution abatement are summarized in Table VI and appear verbatim in Appendix A. Their 29 different views fall into six categories.

Seven suggestions (items one through seven in Table VI) for federal studies were made by all states except Maine and New Hampshire, four of which were of general application. They included requests for establishment of a surveillance program so that changes in water quality can be recognized as abatement is achieved, for a compilation of estuarine and ecologic research data, for basic studies (as opposed to "superficial data gathering surveys") of estuarine ecology, and for studies on the relation of water pollution to the health risk from shellfish consumption.

Six suggestions (items eight through thirteen) for federal financial assistance were made by all states except New York. Four states requested federal funds to enable state and local governments to acquire wetlands before they are destroyed. Many of the present owners would welcome an alternative to developers. Four states would like more funds for treatment plant construction, for optimal outfall location studies, and for tax benefits to industries treating wastes where municipal facilities are unavailable. Four states would like funds for planning and research grants or for direct subsidies to state agencies and programs. Federal programs exist in many of these areas.

Six suggestions (items 14 through 19) for better cooperation and more coordinated planning between government agencies were made by all the states except New Jersey and Delaware, ranging from a request that all federal cooperation be channeled through a single agency, through a request for greater federal backing of interstate compacts, to a request for coordinated planning among the several levels of government. One state felt the federal government should consider existing state programs before initiating federal projects.

Table VI

Summary of State Policy Recommendations

Item No.	Recommendation	States
1.	There should be federal studies on the relationship between pollution and the health risk associated with shellfish consumption.	R.I.
2.	The Federal Government should conduct basic studies of estuarine ecology (and not "superficial data gathering surveys").	Conn.
3.	The Federal Government should make and keep up-to-date a compilation of existing research data concerning estuaries and their ecology.	Conn., Mass.
4.	The Federal Government should maintain a surveillance program so that estuarine waters can be upgraded as abatement is achieved.	N.Y.
5.	The Federal Government should construct an hydraulic model of Great South, Moriches and Shinnecock Bays.	N.Y.
6.	The Federal Government should conduct a study of Delaware Bay.	N.J., Del.
7.	The Federal Government should establish federal estuarine study centers at various locations around the country, one of which should be Delaware.	Del.
8.	The Federal Government should provide adequate funds for construction grants.	Me., R.I., N.J.
9.	The Federal Government should provide funds to assist other state programs.	Me., R.I., N.J.
10.	The Federal Government should provide funds to enable state and local governments to acquire wetlands.	N.H., Conn., Del., Mass.
11.	The Federal Government should provide funds for planning and research grants to aid state agencies, such as universities, fish and game departments, economic development planners, recreation agencies, and water pollution control agencies.	N.H.
12.	The Federal Government should provide tax benefits for industries treating wastes where muni-	R.I.

Item No.	Recommendation	States
	cipal service is not available.	
13.	The Federal Government should provide funds to aid states in determining the optimum distribution of estuarine outfalls.	Conn.
14.	The Federal Government should consider what state programs are presently in progress before initiating federal projects.	Me.
15.	There should be coordinated planning among several levels of government.	N.H., N.Y.
16.	The Federal Government should encourage, by fiscal or other means, state investigations of estuarine pollution.	R.I., Mass.
17.	The Federal Government should promote interstate water pollution control compacts, which have the virtue of encouraging cooperation and uniform standards among the states.	R.I.
18.	The Federal Government should encourage wetland and water zoning.	N.Y.
19.	Federal cooperation with the states should be channeled through a single agency.	N.Y.
20.	There should be more stringent federal controls on oil pollution.	N.H., R.I.
21.	There should be federal legislation concerning vessel pollution (other than oil).	R.I., N.J., Del.
22.	Tanker movements in estuaries should be prohibited during adverse conditions to prevent possibility of major oil spills.	R.I.
23.	There should be federal studies to find a means for cleaning up spilled heavy oils.	R.I.
24.	The Federal Government should investigate the disposal of used crankcase oil and initiate a program to protect estuaries from this pollution source.	Del.
25.	The Federal Government should eliminate pollution from federal facilities.	R.I.
26.	On Long Island, all waste discharges should be eliminated from harbors, bays and tidal streams.	N.Y.

Item No.	Recommendation	States
27.	The Federal Government should establish policies and police the dumping of wastes at sea outside state limits.	N.J.
28.	There should be more stringent federal controls on dredge and spoil operations.	N.H.
29.	New York State feels that controls exist which permit mineral mining without detriment to estuarine resources.	N.Y.

Five suggestions (items 20 through 24) concerning vessel and oil pollution were made by four states. They involved requests for more stringent federal controls, studies of safe disposal methods and studies of ways to clean up after spills.

Three suggestions (items 25-27) concerned waste discharges. A request that pollution from federal facilities be eliminated should be met in accordance with Executive Order 11288.

Two suggestions (items 28 and 29) reflected diametrically opposed views on the need for specific federal legislation to control dredging in estuaries.

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APPENDIX A

Preliminary State Policy Opinions

APPENDIX A-1

Maine

STATE OF MAINE
WATER IMPROVEMENT COMMISSION
AUGUSTA, MAINE 04330

November 9, 1967

Mr. John S. Farlow, III
Director
Hudson-Champlain Project
Federal Water Pollution Control Administration
Metuchen, New Jersey 08840

Attention: Project Oceanographer

Dear Mr. Farlow:

Following your meeting of September 28, 1967, with the ad hoc estuarine study committee the following letter was developed by this committee in an effort to set forth the position of Maine with respect to the development of tidal estuaries and the state-federal role therein.

The various agencies of state government have been very much aware of the value of tidal estuaries and of the problems that beset them as well. As a result pollution control programs, recreational development programs, and research and development in the field of sport fisheries, commercial fisheries, game management, etc. have been undertaken and are in various stages of development. For this reason we believe it is important that the studies now programed by the federal government give ample consideration to the state programs already begun.

The key to all state programs involving estuaries appears to be mitigation of pollution and in this respect attention is called to the status of the grant program under Public Law 660. Planning for the municipal projects involved in this phase of the work is virtually complete and adequate funding would move pollution control ahead at an unprecedented rate thus facilitating specific development projects.

The estuarine committee will be glad to cooperate with federal agencies in the studies of estuary development but we do wish to place emphasis on the fact that many programs exist which require funding in addition to such new programs as might be indicated by the protracted studies.

Sincerely yours,

R. W. Macdonald

R.W. Macdonald
Chief Engineer
Water & Air Environmental
Improvement Commission

RWM:lg

APPENDIX A-2

New Hampshire

The State of New Hampshire

COMMISSIONERS

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RUSSELL B. TOBEY

Water Supply and Pollution Control Commission
61 South Spring Street
Concord
03301

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EXECUTIVE DIRECTOR

THOMAS A. LaCAVA, P.E.
DEPUTY EXECUTIVE DIRECTOR
AND CHIEF ENGINEER

CLARENCE W. METCALF, M.P.H.
DIRECTOR OF
MUNICIPAL SERVICES

December 8, 1967

Mr. John S. Farlow III
Project Oceanographer
U. S. Dept. of the Interior
Federal Water Pollution Control Admn.
Metuchen, New Jersey 08840

Dear Mr. Farlow:

Re: National Estuarine
Pollution Study

The importance of the estuarine areas in the State of New Hampshire and their relationship to the economic, social and recreational assets of the State has long been recognized. To provide a meaningful program of pollution abatement, the State has recently completed the classification of the Atlantic Ocean within the jurisdiction of the State and all other surface waters of the coastal watershed. While the estuarine area of the State is comparatively small, its economic importance to the seacoast region and the entire State is of great importance and every effort should be made to prevent improper encroachment and to insure the most beneficial use to future generations. The progressive downgrading of the estuarine areas of the State has long been known by conservationists and concerned State and local agencies, but effective coordinated effort to effectively improve existing conditions has not been fully realized. It is absolutely necessary that early effective planning by interested private, local, State and Federal agencies be instituted to provide for upgrading and beneficial limited development of the area consistent with the greatest public good.

To assist local and State agencies in developing a worthwhile program of estuarine management, it is necessary that Federal assistance be provided through proper legislation and funding. However, no new Federal legislative action, with the exception of more stringent controls of dredging and spoil operations in coastal and estuarine areas and pollution resulting from fuel operations, should be undertaken until such time as the present study is completed. Upon completion of the report, maximum possible funding should be provided to enable local and State agencies to determine ownership and acquire title to wetlands now undeveloped to insure a balance between developed and undeveloped areas.

Funds should also be provided, through new Federal legislation, for planning and research grants to be distributed to State agencies such as State universities, fish and game departments, economic development groups, recreation and those responsible for pollution abatement to assist in orderly planning and implementation of plans to conserve this most vital of natural resources.

We will do everything possible to assist you in your work in order to achieve our mutual goals of an effective program of estuarine management consistent with the maximum benefit to the public.

Very truly yours,

Daniel Collins, P.E.
Associate Sanitary Engineer

DC/sb

APPENDIX A-3

Massachusetts

The Commonwealth of Massachusetts
Department of Natural Resources
State Office Building, Government Center
100 Cambridge Street, Boston 02202

February 1, 1968

Mr. John S. Farlow, III
Project Oceanographer
North Atlantic Water Quality Management Center
Federal Water Pollution Control Administration
Metuchen, New Jersey 08840

Dear Mr. Farlow:

I am pleased to send you, in outline form, a policy statement on how the federal government may assist the Commonwealth through its estuarine pollution control program.

1. The Commonwealth has sufficient statutory authority to reserve its high value coastal wetlands for various purposes, including the propagation and production of its fisheries.

2. Because the protection of coastal wetlands is transitory (one state may accomplish only a proportionate part of the total program), it remains for the United States to entice all states to accomplish their portion of the program.

3. It is perhaps too obvious to indicate that the protection of coastal wetlands relates directly to favorable water quality attainment.

4. With respect to a state which is in the process of doing its job, the United States can be helpful to a vital degree -

   a) by providing funds for the biological investigation and reporting required to substantiate the state's use of its authority;

   b) by cooperating with the state, on a partnership basis, in providing a fair share of the ultimate cost of settling claims where this becomes necessary.

Mr. John S. Farlow, III.

5. Local coastal communities are willing to join this partnership.

6. Estuarine protection relates also to outdoor recreation which is oriented toward salt water uses.

7. Open space programs should also be considered as a source of estuarine protection assistance.

Sincerely,

Robert L. Yasi

Robert L. Yasi
Commissioner

RLY:hw

APPENDIX A-4

Rhode Island

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
DEPARTMENT OF HEALTH

DIRECTOR OF HEALTH
JOSEPH E. CANNON, M.D., M.P.H.

December 27, 1967

Director
Hudson-Champlain Project
F.W.P.C.A.
Metuchen, N. J. 08840

Attention: Mr. John S. Farlow, III
Project Oceanographer

Dear Sir:

Enclosed please find a copy of the comments of the Rhode Island Department of Health on Estuarine Pollution and the Federal Government, together with a summary of the Estuarine Projects Underway in Rhode Island, prepared by Mr. Walter J. Shea.

Trusting this is the information you desire, I am

Yours very truly,

CAM:mn

Carleton A. Maine, Chief
Division of Water Pollution Control
Department of Health

Enclosures

Comments of Rhode Island Department of Health
Division of Water Pollution Control
on
Estuarine Water Pollution and the
Federal Government

It is felt that the federal government can contribute significantly to the abatement of estuarine pollution in the following ways.

1. Carry out an intensive study of practical means of dealing with sewage pollution caused by vessels in coastwise and international commerce. When satisfactory means have been found, adopt a program devised to require their adoption.

2. Regulate oil tankers and all vessels burning oil so as to minimize highly destructive oil pollution. Such regulation would include preventing the movement of tankers in the close quarters of estuaries when poor visibility or other conditions make great the danger of grounding.

Study means of removing heavy oils spilled into estuaries because satisfactory means of removal are now lacking.

3. Attempt to supply better information on the relation of pollution to the health risk of shellfish consumption.

4. Eliminate promptly pollution caused by agencies of the federal government.

5. Encourage state conducted investigations of water pollution in estuaries using all means available to the federal government, including special grants.

6. Promote interstate compacts for estuarine water pollution control as a means for vital interstate cooperation and uniform standards and objectives.

7. Appropriate, fully, water pollution control construction grant authorizations of law or accept responsibility for delaying water pollution control progress.

8. Develop greater tax benefits for industry upon the installation of water pollution control means where no municipal service is available.

Summary of Estuarine Projects Underway in Rhode Island

Estuarine projects being carried out by the Division of Water Pollution Control during fiscal 1968 include the following:

Chemical and Bacteriological studies of sea waters

- Mount Hope Bay
- Newport Harbor
- Annaquatucket River and Bissel Cove
- Greenwich Bay
- Point Judith Pond

Bacteriological studies of sea waters

- Upper Narragansett Bay
- Sakonnet River and Harbor
- Melville
- Jamestown (North Point)
- Narragansett Bay (West Passage)

Weekly year around sampling for bacteriological analysis at selected stations

- Upper Narragansett Bay
- Mount Hope Bay
- Greenwich Bay
- Warren and Barrington Rivers

APPENDIX A-5

Connecticut

STATE OF CONNECTICUT
BOARD OF FISHERIES AND GAME
STATE OFFICE BUILDING • HARTFORD 15, CONNECTICUT

November 29, 1967

Mr. John S. Farlow
Hudson-Champlain & Metropolitan Coastal Comprehensive
Water Pollution Control Project
Metuchen, New Jersey 08840

Dear Mr. Farlow:

The following comments have received the concurrence of Mr. John Curry, Director of the State Water Resources Commission and are in response to your letter of November 14 requesting our thoughts on the type of federal legislation which would be desirable for the proper management of our estuarine resources.

Our estuarine problems are essentially two-fold: the destruction of our tidal wetlands, intertidal flats and shoal areas; and pollution.

In evaluating possible means of providing for the prudent utilization of our estuarine resources, certain facts are evident. It is generally accepted that the State owns all land below the mean high water mark and the State Water Resources Commission administers a statutory provision requiring permits for dredging or the extension of structures or fill beyond the mean high water mark; thus we have the means of controlling these activities. There is, however, no realistic legal control over the destruction of our tidal marshes which are in large measure privately owned. We have considered forms of marshland zoning similar to legislation adopted by Massachusetts and Rhode Island; however, we are cognizant of Connecticut's laws and resource needs and seriously question the wisdom of such legislation, maintaining that at best it is a stop-gap measure and further, that it restricts the use of private property so that it cannot be used for any reasonable purpose, thus going beyond the reasonable exercise of police power and regulation resulting in confiscation. Similar federal control would be equally undesirable or even more so since the federal government is far removed from local problems and needs.

We believe that State ownership of all significant tidal wetlands offers the only real solution and to this end have initiated an accelerated program of wetlands acquisition. Adequate State funds are lacking and federal assistance presently appears quite limited. A liberal federal grant program, earmarked for tidal marsh acquisition and providing for staff and such indirect costs as appraisal, title search and surveys would be helpful. Lands acquired by such a program would best be managed by the State.

A federal program providing for the compilation of existing research data and the initiation of coordinated basic investigations into the interrelationships of our estuaries and the creatures that inhabit such areas during all or part of their lives is needed. We do not need any more superficial data gathering surveys which only serve to duplicate the efforts of others.

Aside from the aspect of physical destruction of our estuaries, the Water Resources Commission is interested in any program which the Federal Government may develop in respect to estuarine pollution abatement.

Both our planning for the immediate future and our long range planning for pollution abatement will indicate the logical number of outlets, their volume and general location. Many of these, maybe 25, would be located in estuarine areas according to the presently used definitions. In the complexities of an estuary, the specific location of the discharge must be determined by a relatively complex engineering and mathematical analysis. This type of study because it is applicable to similar situations throughout the country has been considered by the Commission as suitable work on which to request federal assistance. None of the existing federal programs with which we are familiar apparently have the funds or directive to assist in this area. We would suggest that a program directly related to estuarine matters be designed to provide this type of cooperation.

Sincerely yours,

Theodore B. Bampton
Director

B/B
cc: J. Gill
J. Curry

APPENDIX A-6

New York

HOLLIS S. INGRAHAM, M.D.
COMMISSIONER

STATE OF NEW YORK
DEPARTMENT OF HEALTH

84 HOLLAND AVENUE
ALBANY, NEW YORK 12208

ENVIRONMENTAL HEALTH SERVICE

DWIGHT F. METZLER, P.E.
DEPUTY COMMISSIONER

DIVISION OF PURE WATERS

December 20, 1967

Mr. John S. Farlow
Project Oceanographer
North Atlantic Water Quality
Management Center
Federal Water Pollution Control
Administration
U.S. Department of the Interior
Metuchen, New Jersey 08840

Dear Mr. Farlow:

Attached is a preliminary statement consolidating New York State's attitudes and practices concerning estuarine resource management. It is our understanding that this will be incorporated in a preparatory report being assembled by your agency and that a final report is planned for a later date.

We will want to comment further, and perhaps more extensively, upon receipt and review of your first report.

Very truly yours,

Arthur Handley, P.E.
Associate Director
Division of Pure Waters

Attachment

New York State Estuarine Management Policies
and Recommendations to the Federal Water
Pollution Control Administration

1. The State supports the basic concept of Federal, State and local cooperation in the management of its estuarine resources. Identification and evaluation of the estuarine areas of the state is in various stages of completion. Pollution sources, for instance, have been identified and abatement programs are under way. The State's water quality standards, which have been approved by the FWPCA cover all estuarine areas. Further studies, including land management practices of estuarine areas, are under way by the Hudson River Valley Commission, the State's Office of Planning Coordination and the many counties and towns contiguous to estuarine areas.
2. The State's purpose to guarantee the preservation, enhancement and development of the scenic, historic, recreational, ecological and natural resources of its estuarine areas is demonstrated by existing statutes embodied in the State Constitution, Civil Practices Laws and Rules, Conservation Law, County Law, General Municipal Law, Local Finance Law, Navigation Law, Public Authorities Law, Public Health Law, Soil and Water Conservation Law, Town Law, Village Law, and the unconsolidated Laws of New York State (specific references available if required).
3. Further preserve the state's estuarine resources in their natural state by encouraging both land, wetlands and water zoning. The federal government should join the partnership which exists in this effort.
4. The State recommends that federal cooperative effort with the states be managed by a single federal agency so that program coordination is possible.
5. On Long Island, eliminate all treated or untreated discharges from municipal,

industrial and agricultural wastewater treatment facilities from harbors, bays and tidal streams.

6. Continue a vigorous water pollution abatement and monitoring program so that water quality classifications assigned may be upgraded as water pollution abatement is achieved.
7. The State acknowledges that mineral resources abound in and adjacent to estuarine areas and that controls exist which permit mining of mineral resources without detriment to the resource.
8. The State recommends that a physical model of the Great South, Moriches and Shinnecock Bays be constructed to assist in the formulation of beach stabilization and ecological studies.

12/15/67

APPENDIX A-7

New Jersey

ROSCOE P. KANDLE, M.D., M.P.H.
State Commissioner of Health

OFFICE OF THE COMMISSIONER

State of New Jersey

DEPARTMENT OF HEALTH
JOHN FITCH PLAZA, P.O. BOX 1540, TRENTON, 08625

November 30, 1967

Mr. John S. Farlow, Oceanographer
National Estuarine Pollution Study
Federal Water Pollution Control Administration
Hudson-Champlain and Metropolitan
Coastal Comprehensive Water
Pollution Control Project
Metuchen, New Jersey 08840

Dear Mr. Farlow:

Transmitted herewith are two copies of our "Preliminary Statement" in relation to the National Estuarine Pollution Study. This Statement has been prepared by the State Department of Health in accordance with the understanding established between Governor Hughes and Mr. Kenneth Holum, Acting Secretary of the Interior.

You will please note that in addition to the enclosures mentioned in the text of our Statement, we also have included a copy of a Statement prepared by Commissioner Robert A. Roe of the State Department of Conservation and Economic Development. Most of Commissioner Roe's statement has been included in a summarized form in our Statement, but Commissioner Roe has agreed that the record might be somewhat more complete if we included his Statement.

Please be assured of our desire to cooperate fully with the National Estuarine Pollution Study. We shall be pleased to endeavor to supply additional information as you may deem advisable.

Sincerely,

Roscoe P. Kandle, M.D.
State Commissioner of Health

Enclosures

STATE OF NEW JERSEY

NATIONAL ESTUARINE POLLUTION STUDY

PRELIMINARY STATEMENT

PURPOSE OF STATEMENT

This preliminary statement has been prepared as a cooperative endeavor with the United States Department of the Interior in accordance with the Clean Water Restoration Act of 1966 (P.L. 89-753). It is the intent of this statement to set forth concisely the consensus of various disciplines representing units of New Jersey State government having major interests in the subject, especially the State Departments of Health and Conservation and Economic Development.

NATURE OF ESTUARIES IN GENERAL

New Jersey estuaries are areas of continual change. Here salt water meets fresh, the sea encroaches periodically upon the land and the seasons are accentuated by winter ice and summer sun. Estuarine populations, including organisms, are altered seriously by gross changes in the environment. The level of the salt marsh responds quickly to changes in tidal regimens caused by inlet modifications and channel dredging; invisible boundaries of benthic species shift with changing river flows.

The maintenance of a healthful environment in our estuaries depends on a continuing supply of fresh water of good quality in the proper amounts and at the proper times. Fresh water running to sea thus is not wasted. Adequate supply is necessary to maintain the entire array of species that characterize the estuary. For example, the dependence of natural oyster beds on fresh water supply at the head of estuaries makes them especially vulnerable to pollutants carried by rivers.

Man-induced changes in current regimen, in stream silt loads and through harbor construction for example may all be expected to influence estuarine populations of shellfish through changes in bottom type. Generally, modifications by man have been destructive with respect to the former ecology of estuaries.

Estuaries are an ecosystem with an amazing biological productivity. Probably no other areas on earth have the unique attributes of the estuaries, and since they comprise a relatively scarce type of habitat, they should be used to the best advantage for the greatest number of people.

Of particular importance is the role that the estuarine ecosystem plays in furnishing spawning and nursery areas for several species of fish that contribute significantly to the fishery resource in the offshort waters of the ocean.

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Sociologically, the estuaries offer a wide range of recreational activities that includes fishing, shellfishing, hunting, boating, water skiing, bathing, nature study and the opportunity to enjoy space and solitude. These activities, coupled with a mild and invigorating climate, furnish benefits both physical and psychological to those who participate in estuarine recreation.

The economic value of our estuaries is very great. Each year thousands of vacationists visit the shore area and many of these utilize the recreational potential of the estuaries. Many housing developments have been constructed so that people would be near the waters' edge. Some industries have moved to the estuary to utilize the copious water supply. It is reported that in 1965 the fishery landings of the Middle Atlantic Bight totalled 948,525,000 pounds, worth an estimated $64,870,000 to fishermen. It is estimated that at least 70% of this catch consisted of estuarine dependent species which would have a value of approximately $45,000,000 (three times that amount on the retail market).

ESTUARIES OF NEW JERSEY

New Jersey is a coastal state. New Jersey is, in effect, a peninsula bounded on the north by New York State, on the east by the Hudson River and the Atlantic Ocean, and on the south and west by the Delaware Bay and River. For the considerations of this statement, the estuarial waters of New Jersey may be divided into three geographical areas generally as follows:

1. The Hudson River Valley including Sandy Hook and Raritan Bays.

2. The coastal area from Sandy Hook to Cape May Point including the ocean waters as well as the tidal inland waterways.

3. The Delaware Bay and Delaware River north to the City of Trenton.

The Hudson River Valley Including Sandy Hook and Raritan Bays

This estuarine area, an interstate one for the most part, is located in a densely populated, highly industralized, metropolitan complex. Marine terminal operations of the New York-New Jersey Port and oil refineries are dominant industries along most of the shore of this estuary. The Port of New York Authority is the most important single agency in the area with respect to Port operation and transportation. There are several large tracts presently developed and utilized as recreational areas and a number of proposed projects currently in the planning stages. These include parks at the foot of the Palisades along the Hudson, the Liberty Park project and the beaches on both sides of Raritan Bay. There are additional areas along several rivers near the head of tide where such recreational development might be desirable.

Even now the Sandy Hook Bay supports a substantial shellfish industry. It seems reasonable to contemplate that a substantial part of the shellfish

industry, formerly supported in the Raritan Bay, may be restored by the current State Water Pollution Control Program.

Sandy Hook to Cape May Point

This estuarine area includes the ocean surf waters and the tidal inland waterways. This area supports a tourist and resort industry estimated at $2,400,000,000 annually. The inland waterways are used chiefly for water oriented recreation such as boating, swimming, crabbing, clamming and fishing. The maintenance, preservation and protection of wide beach areas and the facilities for surf bathing and recreation and adequate regional water pollution control facilities are the major engineering problems in this area.

The shellfish industry even now is of substantial significance. It is reasonable to anticipate that much of this industry, which has been lost because of water pollution, may be restored by the current State Water Pollution Control Program.

Increasing industrial development is creating new thermal pollution problems in this area. The full effects on the ecology from thermal pollution as the result of nuclear power generating facilities, such as the installation at Oyster Creek, are unknown.

The rapid growth of marina and lagoon type homes and developments are creating a serious sanitary waste problem and removing salt marsh areas from the marine food cycle.

One of the most fundamental questions in this area is one of conflicting land uses. Large tracts for fish and game preserves are desirable but under attack because of the need for industrial and other development.

The Delaware Bay and the Delaware River North to the City of Trenton

This estuarine area is unique in that it is interstate and, in part, controlled by the Delaware River Basin Commission, the Delaware River and Bay Authority and certain other bridge and/or port authorities.

Because of the silt load during storm flows the maintenance of channels and the disposal of soil in the upper reaches has become a serious problem. The industrial development and the continuous dredging of navigation channels and anchorages for major port facilities in the middle to upper reaches has a profound effect upon the character of the downstream estuarine areas of Delaware Bay. Delaware Bay at present is relatively undeveloped; it contains the beds of much of New Jersey shellfish industry and the marshes on the New Jersey side are a major contributor to the nutrient flow from Delaware Bay for ocean fisheries.

The Delaware River is used as a source of potable water directly at Torresdale and indirectly on both sides of the River as far south as the mouth of the Schuylkill. The effect on water quality of river water upon water supplies in New Jersey downstream from Camden has as yet to be determined.

From the vicinity of Salem downstream and seaward on the New Jersey side the Delaware River and Delaware Bay are essentially rural, undeveloped marshes. These marshes are making large contributions to the nutrient cycle of marine ecology. The New Jersey side of the Bay provides the nucleus of the seed beds and oyster beds of the New Jersey shellfish industry. Large tracts of tidal swamp and shore line have already been acquired by the State for preservation under New Jersey's Green Acres Open Space Land Acquisition Program.

SHELLFISH AND PUBLIC HEALTH

The Shellfish Control Program of the New Jersey State Department of Health is vitally interested in the estuarine areas of the State.

New Jersey is a producing State as well as a consuming State for oysters, clams and mussels. New Jersey estuaries are production areas where shellfish live, grow, reproduce and are harvested. Any change in an estuary which might alter the acceptability of harvested shellfish for market purposes is of interest to the Shellfish Control Program.

This Program is charged with the responsibility of assuring the consuming public of a safe product. Since the shellfish is a filter feeder it reflects the quality of the waters in which it lives and since it is traditionally consumed raw or perhaps steamed (which does not necessarily kill any pathogenic organisms which might be present), it is of prime importance that the growing waters be of excellent quality.

Pollution of estuaries necessitates their condemnation for shellfish harvesting because of the danger to the public health. Such action limits the industry as to where it may operate and at the same time it could be a real temptation to violate the condemnation order if a productive harvest is involved. The prevention of harvesting from condemned areas is a responsibility involving genuine expense.

The Shellfish Control Program must concern itself with any pollutant which may be transmitted by way of shellfish to man and prove harmful to him. The Program is concerned therefore with the broad range of pollutants which may find their way into estuarine waters used for shellfish harvesting.

WATER POLLUTION CONTROL IN NEW JERSEY

Water pollution control is a responsibility of the State Department of Health in New Jersey. In the North Jersey-New York City metropolitan area these responsibilities are shared with the Interstate Sanitation Commission. In the Delaware River Basin these responsibilities are shared with the Delaware River Basin Commission. There are a number of Departments of the State government having substantial interest in various facets of water pollution control.

The State Department of Health, in the water pollution control field, operates essentially as an enforcement agency. The enforcement activities are supplemented and supported by technical consultation, educational and public relations programs.

For the most part, the enforcement functions are relevant to Title 58 of the Revised Statutes and rules and regulations and policies of the Department. These rules and regulations and policies include but are not limited to the following:

1. Regulations classifying the various streams of the State and establishing standards of quality for the waters of the various streams.

2. Regulations establishing minimum degrees of treatment for wastewaters before discharge into the streams of the State.

3. Rules and regulations governing the design of wastewater treatment and disposal facilities.

Copies of the enumerated regulations are attached as appendices.

Hudson River Area

The regulations of the State Department of Health classifying the waters of the Hudson River, Arthur Kill and tributaries carry an effective date of May 16, 1966. Details are contained in the regulations, a copy of which is attached as aforesaid. Suffice it to say for the purposes of the text of this statement that the New Jersey waters of the Hudson River, per se, are classified as TW-2, defined as "tidal surface waters having limited recreational value and ordinarily not acceptable for bathing but suitable for fish survival although perhaps not suitable for fish propagation. These waters shall not be an odor nuisance and shall not cause damage to pleasure craft having occasion to traverse the waters." The regulations establish standards of quality for these waters.

The State Department of Health has issued appropriate orders including specific timetables designed to effect intensification of sewage treatment in this estuarine area. A copy of a typical order is attached.

The interstate waters of the Hudson River have been the subject of two conferences called by the Federal Water Pollution Control Administration pursuant to the Federal Water Pollution Control Act. The second of these conferences was held in New York City on September 20-21, 1967. A copy of the conclusions and recommendations of this conference is attached. The most significant conclusions reached for the purposes of this statement are as follows:

"2. Considerable progress has been made toward abating this pollution problem and the programs underway, when carried to their logical conclusion, will abate and control this pollution."

"5. The conferees accept its schedule that all remedial facilities will be placed in operation by 1970 except the described New York facility which cannot be completed and in operation until 1972."

It is significant to note that the orders issued by the New Jersey State Department of Health are in conformity with these conclusions.

Sandy Hook and Raritan Bays

The regulations of the State Department of Health classifying the waters of the Raritan River Basin including Raritan Bay carry the effective date of April 15, 1965. Details are contained in the copy attached.

For the purposes of these regulations the Sandy Hook and Raritan Bays are one and the same body of water. These waters are classified as TW-1 defined as "tidal surface waters suitable for all recreational purposes, as a source of public potable water supply where permitted, and, where shellfishing is permitted, to be suitable for such purposes."

The regulations classifying the waters of the Raritan Bay include the following: "Class TW-1 - the main stem of the Raritan River and the tidal reaches of tributaries thereto from Fieldsville Dam to and including the Raritan Bay and the tidal reaches of its tributaries, exclusive of the Arthur Kill. These waters are not a source of public potable water supply and, therefore, standards of quality and criteria referring exclusively to water supplies are not applicable. The standards of quality and bacteria criteria for shellfish growing areas are applicable only in areas where shellfish harvesting is permitted by the Department.

These waters shall be maintained in a condition suitable for all recreational purposes."

It should be understood that in the administration of the water pollution control program in New Jersey, it is the policy of the State Department of Health to require degrees of sewage treatment designed to effect enhancement of the quality of all surface waters in the State and, specifically in relation to the Raritan Bay, this policy is designed to effect improvement so that the standards of quality for shellfish waters may be attained in the Bay so that the "open areas" for shellfish harvesting may be expanded in which circumstances shellfish harvesting will be "permitted by the Department."

Appropriate orders including specific timetables have been issued in relation to this estuarine area. A copy of a typical order is attached.

The interstate waters of the Raritan Bay estuary were the subject of three conferences held in New York City pursuant to the Federal Water Pollution Control Act. The third conference was held on June 13-14, 1967. A copy of the conclusions of this conference is attached. Most significant for the purposes of this statement in these conclusions are the following:

"2. Considerable progress has been made toward abating this pollution problem."

"3. Progress has not been more rapid because of the complexity of the discharges and the difficulties in dealing with controlling pollution in an estuarine system of waters such as exists in Raritan Bay."

"9. The schedule for remedial action is as follows:

"That which has been proposed by the States of New York and New Jersey and has largely been included in orders and stipulations by those States. The schedule for New York is contained in Appendix A. The New Jersey schedule is contained in Appendix B. These schedules for remedial action established by New York and New Jersey have been accepted by the conferees.

All of the improvements will be in operation between 1967 and 1970, except the expansion of one plant will be in operation by 1971, and one interceptor will be completed in 1972."

It is significant to note that the timetables contained in the orders issued by the New Jersey State Department of Health are in conformity with these conclusions.

Sandy Hook to Cape May Point

The regulations of the State Department of Health classifying the surface waters of the "Atlantic Coastal Plain" carry an effective date of May 24, 1967. Details are contained in the copy attached.

The tidal inland waters are classified as TW-1 defined as "tidal surface waters suitable for all recreational purposes, as a source of public potable water supply where permitted, and, where shellfishing is permitted, to be suitable for such purposes."

The ocean waters within 1,500 feet from mean low tide or to a depth of 15 feet, whichever is more distant from the mean low tide line, are classified as CW-1. The ocean waters not included under CW-1 are classified as CW-2 out to the three mile limit.

CW-1 waters are defined as "ocean waters expected to be suitable for all recreational purposes including fishing, the propagation and migration of native fish species desired for angling and other fish and aquatic life necessary thereto as well as any other reasonable use."

CW-2 waters are defined as "ocean waters expected to be suitable for all recreational uses, including those in Class CW-1, except bathing."

Appropriate orders including specific timetables have been issued in relation to this estuarine area. A copy of a typical order is attached.

Most of the waters of this estuarine area were the subject of a conference held in Atlantic City pursuant to the Federal Water Pollution Control Act on November 1-2, 1967. This conference dealt specifically with the "navigable waters of eastern New Jersey from Shark River to Cape May and their tributaries." A copy of the conclusions of this conference is attached. Most significant for the purposes of this statement are the following:

"2. Because of the existing or potential pollution of these waters, the State of New Jersey, under the cooperative arrangements governing the National Shellfish Sanitation Program, has closed more than 36,000 acres of water to the direct harvesting of shellfish, leaving 127,000 acres available for shellfish harvesting. These closures have caused substantial economic injury resulting from the inability to market shellfish or shellfish products in interstate commerce. The estimated economic loss to the region is at least $1.5 million annually."

"6. Discharges from boats are an increasingly important source of pollution. Other sources of pollution to these waters include overflow of seepage from cesspools and septic tanks, and surface or groundwater runoff of agricultural chemicals."

"8. Pollution of these waters is complicated further by natural hydrographic conditions. Many of the bays have very restricted connections with the ocean. As a result of this lack of available circulation, pollutants are not readily flushed from these waters, which further increases the degradation of water quality."

"9. The New Jersey State Department of Health has adopted water quality standards for the waters covered by this report, and has submitted the standards to the Secretary of the Interior for approval as Federal water quality standards under the provisions of Section 10 of the Federal Water Pollution Control Act, as amended. These standards require that all wastes discharged to the Atlantic Ocean receive, as a minimum, treatment that will provide at all times 85% removal of BOD, and that all wastes discharged to the estuaries or tributary streams receive a minimum treatment at all times of 95% removal of BOD. Abatement orders issued under these standards further require effective year-round disinfection, with construction to be undertaken in accordance with the following schedule:

"a. Preliminary plans for treatment or for upgrading of facilities to be submitted on or before October 30, 1968;

"b. Final construction plans to be submitted on or before and approved by June 1, 1969;

"c. Construction to be initiated on or before October 1, 1969 and to be completed on or before November 30, 1970.

"New Jersey now has statutory authority to require water pollution control facilities to conform to State approved regional plans.

"The treatment requirements and time schedule established by these standards and orders represents marked progress in pollution abatement."

"10. However, to permit reopening of a maximum number of those areas presently closed to the harvesting of shellfish under the National Shellfish Sanitation Program, it will be necessary for even treated wastes to be eliminated, since some danger of contamination exists even when adequate treatment is provided. Construction of regional waste treatment systems which provide adequate treatment prior to discharge through a limited number of outfalls into the estuaries or through outfall lines extended into the Atlantic Ocean will permit opening many areas now closed to the harvesting of shellfish."

"11. Control measures aimed at abating pollution from boats operating in the tidal waters of the area are to be adopted by the State of New Jersey. Such control measures require either adequate treatment facilities aboard vessels equipped with toilets, or holding tanks capable of holding waste material for subsequent discharge to on-shore treatment facilities. Such regulations be adopted so that pollution from this source will be controlled no later than November 30, 1970."

It is significant that master regional engineering plans for sewerage on county-wide and valley bases have been completed or are in advanced stages of preparation for Monmouth, Ocean, Atlantic and Cape May Counties. These master engineering plans are expected to contribute in a major way toward accomplishing the objectives of the State Department of Health in administration of the State Water Pollution Control Program in the Atlantic Coastal Plain.

The oceanographic studies sponsored and financed by the State of New Jersey and made on behalf of the State and the Counties of Monmouth and Ocean are expected to contribute substantially to resolution of the wastewater treatment and disposal problems prevailing in this area of the State. The primary purpose of these studies was to determine acceptable locations of major ocean outfall sewers which might discharge wastewater effluents after a high degree of secondary treatment and chlorination.

Effluent discharges after primary treatment and chlorination have been permitted for decades along the northern part of the coast line from Cape May Point to Beach Haven. For the most part the outfalls have been small and

have served single communities. They have discharged at points varying from 800 to 1,200 feet beyond mean low tide. Under the current program of the State Department of Health regional facilities will be required and points of discharge will be as determined through the oceanographic studies. This will mean discharging into much deeper water at points much more remote from the shore line.

Along the south Jersey coast (south of Beach Haven) the practice to date has been to discharge effluents, after primary treatment and chlorination, to the inland waterways. Here again for the most part the treatment plants have served individual municipalities. Under the current program regional facilities will be required. The orders issued have provided a choice between ocean discharges and discharges to inland waterways subject to the degree of treatment to be provided (see typical order attached).

The oceanographic studies and the feasibility studies which have developed and are developing master engineering plans for regional sewerage facilities have been financed under the State Public Sanitary Sewerage Facilities Assistance Act of 1965 as amended in 1967.

Delaware Estuary

The regulations of the State Department of Health classifying the New Jersey waters of the Delaware River Basin carry the effective date of July 28, 1967. Details are contained in the copy attached.

The main stem of the Delaware River is classified in accordance with "Water Quality Standards for the Delaware River Basin," as adopted by the Delaware River Basin Commission on April 26, 1967 by its Resolution No. 67-7. Tidal tributaries are classified as TW-1 or TW-2 depending upon their locations. For definitions of these classifications see discussion under Hudson River area and Sandy Hook and Raritan Bays given previously in this statement.

No further details are given here in relation to the classification and standards of quality in the Delaware River Basin in consideration of the fact that these matters are being covered in detail by the Delaware River Basin Commission through direct communications with the National Estuarine Pollution Study. Also omitted from any discussion in this statement are the extensive and intensive studies made of the Delaware estuary in recent years, first by the United States Public Health Service, then by the Federal Water Pollution Control Administration (of which the National Estuarine Pollution Study is a part). Complete records of these studies are on file with the Federal Water Pollution Control Administration.

Appropriate orders including specific timetables have been issued and continue to be issued in relation to the Delaware estuarine area. A copy of a typical order is attached.

In connection with the Delaware estuary it should be noted that the Cities of Philadelphia and Camden are barging sewage sludge to sea beyond the jurisdiction of the State of New Jersey.

CONCLUSIONS AND SUGGESTIONS

The following conclusions and suggestions are offered over and beyond those which are obviously intended within the text of this statement.

1. It is imperative that efforts be continued to define as precisely as possible the environmental parameters important for the maintenance of New Jersey estuarine populations. It also is imperative that, pending such precise definitions, significant areas of the estuaries be rigidly protected against gross man-induced changes.

2. From a comprehensive inventory of estuarine resources, there should be developed a master plan establishing use priorities in coastal areas. (It is suggested that certain areas might be zoned for example for oyster production, hard clam production, gravel supply, marinas, waste disposal, power plants, etc.)

3. The program suggested by Nos. 1 and 2 above should be conducted by the State of New Jersey in cooperation with neighboring states and the Delaware River Basin Commission. The technical competence in the various disciplines concerned is available within the various states and the Delaware River Basin Commission. There is no need now for Federal government intervention or for any Federal program to be superimposed upon the State and interstate endeavors in the New Jersey estuarine areas. If it is to be the policy of the Federal government to interest itself in estuarine areas in general, perhaps Federal subsidies designed to assist with advancement of the "local" program would be in order.

4. The Federal government should assume responsibility for and execute an active program of policing of the dumping at sea, beyond State jurisdictions, of sewage sludge, industrial wastes and any other wastes which conceivably could affect adversely the estuarine waters of New Jersey.

5. If any Federal government agency has any suggestions to offer by way of practicable regulations for the control of pollution from boats operating in estuaries, such suggestions would be welcomed in New Jersey.

November 1967

ROSCOE P. KANDLE, M.D., M.P.H.
State Commissioner of Health

RICHARD J. SULLIVAN, Director
Division of Clean Air and Water

State of New Jersey

DEPARTMENT OF HEALTH

JOHN FITCH PLAZA, P.O. BOX 1540, TRENTON, 08625

December 4, 1967

Mr. John S. Farlow, Oceanographer
National Estuarine Pollution Study
Federal Water Pollution Control Administration
Hudson-Champlain and Metropolitan
Coastal Comprehensive Water
Pollution Control Project
Metuchen, New Jersey 08840

Dear Mr. Farlow:

Transmitted herewith, in duplicate, is a copy of a statement entitled "The Delaware River Estuary-Delaware River Basin Commission," sent to me by Ralph Porges, P. E., Water Quality Branch Head of the Delaware River Basin Commission. This Statement was received too late for inclusion in our statement to you on the Estuary. I am transmitting the statement as a supplement to the information already received by you. I offer no comments other than to say that the Commission's statement is compatible with the statement submitted on behalf of the State of New Jersey by Dr. Kandle.

Very truly yours,

Robert S. Shaw, Assistant Director
for Water Pollution Control

Encls.
6S4:G10
c.c. Mr. Ralph Porges
Dr. Kandle

"The Delaware River Estuary - Delaware River Basin Commission"

The Delaware Estuary, which includes Delaware Bay and that part of the Delaware River affected by tidal action, extends from Trenton, New Jersey to the Atlantic Ocean at Capes May and Henlopen. The upper section of the estuary, encompassing 85 miles along the Delaware River from Trenton to Liston Point, beset by major pollution from municipal and industrial wastes, has been the subject of intense study by the Federal Water Pollution Control Administration. The lower section, encompassing Delaware Bay from Liston Point to the sea, considered a clean area and relatively undeveloped, is beset by present and potential problems which require intense study to determine the measures necessary to prevent degradation of its water quality.

The Delaware River Basin Commission's goal is to achieve control of water pollution in close and harmonious relationship with the respective states of the Basin. The Commission has worked in harmony with the State of New Jersey, as demonstrated by the joint action undertaken to establish, with the other States concerned, water quality standards applicable to the entire Delaware Basin. In fact, the public hearing held at Trenton, New Jersey on water quality standards for the Delaware Estuary was a joint hearing, representing both the State of New Jersey and the Commission. The State of New Jersey endorsed the Commission action in establishing specific stream quality criteria and the effluent requirements to protect these criteria. The Commission is now working closely with the State of New Jersey in the development of permissible waste discharges as part of the implementation plan.

For purposes of this discussion, it is well to look at the Delaware River in three major segments. The first segment, or upper part of the Basin, is that portion of the watershed upstream from Trenton. In this area, major impoundments, existing and planned, regulate streamflow for flood control, hydroelectric power generation, out-of-Basin exportations for water supply, and low-flow augmentation for water supply and water quality control in this segment and below.

The second section is defined as the Estuary from Trenton to Liston Point. It is in this area that the Delaware River is significantly polluted, which resulted in the late 1950's in a request by the State and interstate agencies, the City of Philadelphia, and others concerned, for the Public Health Service, now FWPCA, to undertake a detailed study of pollution of the Estuary so that an intelligent and aggressive program of abatement and improvement could be undertaken. This study was completed and the preliminary report revealed in June of 1966. Following careful evaluation by the Commission and after public hearings, stream criteria and effluent requirements were developed and standards adopted by the Delaware River Basin Commission. These standards embody an implementation plan developed by the respective States. Rules and regulations are being developed by the Commission for enforcement of the standards by the States and the Commission.

Since the assimilative capacity of the Estuary in this particular section has been exceeded, the Commission has developed, with FWPCA and the States, a permissible load discharge of organic matter for the four zones within this reach. In turn, load allocations will be specified for each discharger so as not to exceed the capacity of the stream to maintain the designated stream criteria. Rules and regulations are being developed which will support action by the States in issuing abatement orders and outline DRBC procedure for implementation.

The last portion of the Basin is Delaware Bay, from Liston Point to the ocean at Capes May and Henlopen. This forty-eight mile reach is relatively unpolluted and undeveloped. However, steps should be taken, promptly, to develop a comprehensive program so as to prevent degradation of this area.

In August 1966, the Delaware River Basin Commission made a request to the Federal Water Pollution Control Administration to extend the study that it made in the upper tidal reach to the Delaware Bay, as this was a logical sequence because of the interrelationship between the tidal river and the Bay. Furthermore, it was realized that the lack of knowledge concerning the physical, biological and chemical characteristics of the Bay militated against intelligent development of an effective preventive program. It was specified that efforts should be directed toward determining the interaction between the Estuary and Bay, so that the effect of proposed waste control schemes in the Estuary area on the Bay can be determined which would lead to development of a plan of protection for present and future commercial and recreation uses of the Bay. It was suggested that the study include present and future water uses and the sources of waste; the influence of the tidal river, including dredging, on water quality in the Bay; tidal and current movements of the Bay; the effects of water quality on shellfish areas; means of controlling the shellfish drills by water quality controls; and recommended site locations for possible future regional waste outfall discharges.

The National Estuary Pollution Study would be of extreme value if it could support the above rules and be effective in implementing the study of the Delaware Bay.

The Delaware River Basin Commission is aware of the numerous problems of estuaries, is actively concerned with the solution of many of the problems, and will continue to work harmoniously and cooperatively with the States. The State of New Jersey is to be complimented in its progressive outlook and its helpful cooperation with the Commission and its fellow states.

APPENDIX A-8

Delaware

DELAWARE WATER AND AIR RESOURCES COMMISSION

STATE OF DELAWARE

DOVER, DELAWARE

REPORT OF ESTUARINE WATERS OF THE STATE OF DELAWARE

NATIONAL ESTUARINE STUDY

Subject: Estuarine waters of the State of Delaware.

Introduction:

The State of Delaware is blessed with abundant marine resources especially in terms of bays, coastal marshes, and beaches. The principal estuaries in the State are:

1. Delaware Bay
2. Rehoboth Bay
3. Indian River Bay
4. Assawoman Bay

The Atlantic Ocean borders the State for 24 miles and provides an excellent recreational area for surf fishing and water contact sports. Additional morphometric data on these estuaries is being developed and will be submitted later.

Recreation, Fish, Wildlife and Shellfish Potentials:

In 1953, Lewes, Delaware was the top fishery port in the United States and over 360 million pounds of menhaden were landed. A precipitation drop in the catch of menhaden during the past few years has resulted in the closing of a major industrial establishment at Lewes.

Delaware Bay was once a prosperous oyster growing area. Shellfish production has been declining over the years. In addition, crabs, clams, some shad, striped bass, and weak fish are also harvested in the estuaries.

The hinterland of the Delaware Bay, the Atlantic coastline and the bays in Delaware support a population of over five million people. Delaware River is a major navigation route and is connected to the Chesapeake Bay by the Chesapeake and Delaware Canal.

The area between Delaware City and Trenton, New Jersey is highly industrialized, and is dependent on the navigability of the river. Major shipyards and a large naval base essential to national security are located on the upper estuary. There are seven major petrochemical refineries also.

The Bays and the Ocean shoreline attract millions of people during the summer months for water contact recreation. Other principal recreational attractions are fishing, shellfishing, hunting, muskrat trapping, etc.

During the past decade, great strides have been made in many fields of science. As a result of this progress, man is becoming more aware of his environment. He is also becoming aware of the use and often abuse of our natural resources. Terms such as pollution, effluent, secondary treatment, oxygen demanding materials, etc., no longer need an interpretation. The public now expects answers to such questions as:

1. What effect does the polluted river have on the bay?
2. Do large ships contribute a significant pollution to the bay?
3. Why should we not use marsh and swamp areas to dispose of wastes?
4. Will the pollution hurt fishing?

It seems that much of the concern in water pollution centers in the estuary.

We feel that a comprehensive estuary study should be started as soon as possible and should include:

1. Extensive Area

   The water quality study should be extended to include the effects of the ocean as well as tributaries.

2. Benthal Load

   While the Benthal Load effects may be neglected in a straight run stream, it will present complications in lower estuaries. Some of these are:

a. The covering of shellfish areas with the deposition as the loads shift.

b. Provide a harbor for organisms which may infest shellfish.

c. Destruction of food for bottom feeding fish.

d. Reduce the oxygen level at or near the bottom.

3. Dredging

The effects of dredging are varied, some beneficial, others not so beneficial. While we may not eliminate the undesirable effects once the degree of seriousness is established, they can be minimized. Some undesirable effects are:

a. Shifts in Benthal Loads.

b. Destruction of marsh land by disposal of spoil.

c. Reduction of photosynthesis.

d. Changes in flow characteristics.

e. May permit encroachment of salinity to crucial areas.

4. Interaction of Estuary With Surrounding Land Areas

Areas of concern, especially in relation to marsh lands, are:

a. Biogeochemical cycles.

b. Productivity - vegetation, algae, etc., including rate of food consumption by primary consumers.

c. Utilization - kinds, stages of inhabitants.

d. Contribution to estuary - direct or indirect.

e. Economic contribution.

The Congressional Natural Resources and Power Subcommittee of the Committee on Government Operations recently published a pamphlet entitled "To Save America's Small Lakes" in which the recommendation was made to

utilize the surrounding land areas as recreation areas, including parks. While one hesitates to disagree with this as a policy, it certainly warrants careful study before implementation since it could have a detrimental effect on the ecology of the body of water.

5. Effects of Pollution and Environmental Changes Caused by Man on Our Fisheries
   a. Species - numbers and movements.
   b. Changes in "a." as changes in water quality occur.
   c. Life histories of the species.
   d. Causes of fluctuations in abundance and the development techniques of predicting these fluctuations.
   e. Population characteristics of the species.
6. Hydrology and hydraulics of the Bays
   a. Rainfall - runoff patterns.
   b. Effect of marshland on hydraulic behavior.
   c. Tidal current patterns and velocity profiles.
   d. Diffusion characteristics.

Recommendations:

a. We suggest that a comprehensive study of the Delaware Estuary be sponsored as soon as possible because:

1. More data is available on the upper estuary than on any other.
2. A wide variety of industrial waste is present. All industrial wastes, except raw pulp process, are represented in the basin.
3. The basin contains a concentrated population area.
4. A massive cleanup program is in progress. The effect of changes in environment from a polluted to a clean one can be determined. Several

studies have been conducted on the converse, but our knowledge of the effect of a cleanup is primarily based on assumption. Some 750 million to over a billion dollars will be spent in the estuary within the next few years to comply with the Federal Water Pollution Control Administration's guidelines.

5. State agencies and area universities are capable of providing competent technical assistance in all phases.

6. A working Federal-Interstate compact exists in the Delaware Basin.

7. Approximately two million dollars have been spent in a comprehensive study of the upper estuary.

b. We suggest an active Federal-State program for the purchase of marshlands, especially in critical areas, to prevent further encroachment and degradation.

c. We suggest that a Federal boating law be enacted to require treatment of wastes on all boats having bathroom facilities. We feel that state laws will not be effective because of movement of pleasure boats and other vessels from one state to another. The Federal law should require installation of approved treatment units in all new boats manufactured and provide a reasonable period for installation on existing boats and vessels. The vessels of the Department of Defense should <u>not</u> be exempted from this provision.

d. We suggest that new Federal legislation should be enacted to create several regional estuary study centers and that Delaware be selected as one location because:

1. The State of Delaware lies between two of the largest estuaries in the United States; these being the Chesapeake and Delaware Bays.

2. The current Delaware River and Bay water pollution abatement program will render the Delaware Estuary an ideal study laboratory in terms of assessing the effect pollution has had on the Estuary and adjoining wetlands.

3. Many of our largest cities are located along estuaries. This fact should strengthen the need for comprehensive studies of the estuaries and master planning for the adjoining wetlands.

4. Delaware is situated near the center of expanding major metropolitan areas. Estimates reveal that some 30 million people reside within a two hundred (200) mile radius of the capital city of Delaware, which is Dover. Study is required to determine what techniques or mechanisms are required to save lands bordering estuaries in these expanding metropolitan areas.

5. The University of Delaware is greatly interested in Marine Biology and since 1951 has maintained a marine laboratory at the Roosevelt Inlet north of Lewes. The University has leased property south of Lewes on which to build more permanent facilities related to Marine Science. A Regional Estuary Studies Center in Delaware would be closely linked to the research being conducted by the University. The University is currently seeking sponsorship of the studies listed under Item 4, Page 3, of this report. We feel the staff is eminently qualified to conduct this research and urge your immediate support for this project.

e. We suggest that the Federal Government assume leadership in an investigation of the collection and disposal methods of used crankcase oils and take preventive action to curtail serious pollution of the estuaries. Even a small state like Delaware has over 1,200 service stations (and possible source of pollution). An adequate surveillance program to ensure proper disposal of waste oil from these

stations is almost impossible. We have instituted a system for licensing waste oil collectors. In view of the lack of manpower available, a periodic inspection has not been successful. Only the Federal Government can take action to prevent this source of pollution.

APPENDIX B

Data Organization

APPENDIX B-1

Guidelines for Initial Information Input

GUIDELINES FOR INITIAL INFORMATION INPUT ON ESTUARINE SYSTEMS OF EACH REGION

INTRODUCTION

These guidelines are intended to establish a framework for the identification of separate estuarine systems and the presentation of the available information on each of these systems.

It is not intended that all of the available information on each estuarine system be sent to this office in the near future. The major need now is to have available for use in preparation of the interim report a summary of the information which has been collected from the States or which is presently in Regional files.

We would appreciate it if the form presented in these guidelines could be followed as closely as possible, since this will aid us in making comparisons among estuaries in different Regions.

IDENTIFICATION OF ESTUARINE SYSTEMS

A set of C&GS charts suitable for this purpose has been sent to each Regional Office. The object of this identification procedure is to separate the estuaries of the Nation into independent management units. That is, this is not intended to be a scientific or engineering classification system, but a management classification system.

We establish a set of four types of estuarine system based on the nature of the water body to which they are tributary.

I. Primary - join an ocean or sea
II. Secondary - join a Primary estuarine system
III. Tertiary - join a Secondary estuarine system
IV. Quatenary - join a Tertiary estuarine system

From the management classification standpoint, all parallel levels of classification are independent of each other. That is, a Primary estuarine system is independent of all other Primary estuarine systems (but may be related to its own sub-systems for management purposes), a Secondary estuarine system is independent of all other secondary estuarine systems (but may be related to its Primary as well as its sub-systems), etc.

The geographical limits of each estuarine system will have to be set on a judgement basis; only a few general principles can be outlined here.

I. Primary estuarine systems.

(1) There must be some form of embayment, inlet, river mouth, or other significant geographical feature which can carry land drainage to the sea.

(2) To be considered as a separate management area an estuarine system must be of significant size. As a rule of thumb, the minimum significant estuarine size will be that on which some permanent navigational markers are presently maintained as shown on C&GS charts. Smaller features than this will be considered as part of the coastline or as part of a larger management unit.

(3) Coastal shoreline features chosen to define the limits of an estuarine system should be easily relocated and permanent where possible. The approach should be to decide how much coastal area might be affected by pollution having its source within the embayment or river mouth and then to select chart features which inclose this area (all such guesses can be revised later). Possible features which could be used are:

(a) Prominent headlands
(b) 10 - Fathom depth contour
(c) Lighthouses or lightships
(d) Harbor approach ranges
(e) Jetties and breakwaters
(f) Political boundaries

II. Estuarine Subsystems

The same criteria outlined above apply to the identification of estuarine subsystems; in this case the conterminous lines should be such that they could provide locations for monitoring of water quality at the junction of the two systems.

PRESENTATION OF BACKGROUND INFORMATION

This material is to be presented for each estuarine system separately. It is recognized that all of the information requested may not be available for each estuarine system, but even where information is

lacking we would like to have this outline used, including the notation that the information is not available.

A. Name - This will be given on the C&GS charts, and will be either the name of the parent river or a designation such as a Bay, Sound, Harbor, etc.

B. Type - Primary, Secondary, Tertiary, or Quatenary. Give in addition the names of its receiving water systems. For example:

   1. Anacostia River
   2. Tertiary, Potomac River, Chesapeake Bay

C. Size - Tidal shoreline and area if readily available

D. Political Divisions - State whether it is intracounty, intercounty, intrastate, or interstate, and give the names of the political subdivisions in which it lies.

E. Classification by water quality standards - State the classification given to each estuarine system (or part of it) under the Water Quality Standards proposed by the State. Indicate, where possible, whether these classifications have been accepted, rejected, or are under review.

F. Immediate Needs for Pollution Control - State, on the basis of the Immediate Needs Reports what treatment facilities or other steps are needed immediately. This will include estuaries and estuarine zones only.

G. Resource Use - List the major uses of the estuarine system, and if any quantitative estimates are readily available, please include them. Otherwise, give a rough estimate as to which are most important and least important.

H. Interference with Beneficial Use - List any cases of interference with beneficial uses, and state whether the interference was due to pollution or modification of the shoreline. If any quantitative estimates of damages are readily available, please include them.

I. Extent of Development - It is necessary to develop some sort of idea about the extent of urban and industrial development in each estuarine system. For this purpose we would like to have your appraisal of the extent of development of each system, and we

offer these general categories:

1. Rural - no towns, industries, or suburban development
2. Predominantly Rural - a few small population centers, but widely scattered in relation to size of system
3. Suburban - many homes and small towns but no large population or industrial centers.
4. Urban - Moderate-sized population centers with some industry, or large cities with little heavy industry
5. Industrial - much industry in relation to size of estuarine system.
6. Urban Industrial - large cities and great industrial development

If it is possible to give any quantitative estimates of industrial development or activity, please give them.

J. Population of the Estuarine System - The 1960 census figures for populations of the counties conterminous to the estuarine system should be adequate for this purpose.

K. Reports Available - A list should be given of the major reports on various aspects of the estuarine system.

L. Current Studies - Please list any existing studies of the estuarine system or any studies planned for the near future.

APPENDIX B-2

National Estuarine Pollution Study estuarine classification

National Estuarine Pollution Study

ESTUARINE CLASSIFICATION

Northeast Region

Primary	2ndary	3ry	4ry	
NE-1				Bay of Fundy Western Head (Cutler, Me.) -- Westport, N.S. (SW Ledge)
1	1			St. Croix River E. Quoddy Head Hbr. Lite (Me.) → Bliss I. Lite (N.B.)
1	1	1		Cobscook Bay Buckman Head (Eastport, Me.) → Welshpool - Dunn Beach (Campobello I., N.B.) and Lubec, Me. → Charleys Pt. Bridge (Campobello I., N.B.)
1	1	1	1	Dennys and Whiting Bay Leighton Pt. to Denbow Pt.
1	2			Quoddy Roads West Quoddy Head to Liberty Pt. (Conterminous with Cobscook Bay at Lubec-Charleys Point)
1	3			Carrying Place Cove West Quoddy Head → Boot Head
1	4			Baileys Mistake Boot Head → Long Pt.
1	5			Little River Long Pt. → Western Head
2				Little Machias Bay Western Head → Double Head Shot I.
3				Machias Bay → Libby I. Lite
4				Englishman & Chandler Bay → Red Head (Great Wass I.)
5				Western, Pleasant, Nauraugus, & Pigeon Hill Bays → Petit Manan

Primary	2ndary	3ry	4ry	
6				Dyer & Gouldsboro Bay & Prospect Harbor Petit Manan → Schoodic I.
7				Frenchmans Bay → Baker I.
8				Blue Hill Bay → Long I. Head
9				Penobscot Bay → Colt Ledge, Roaring Bull Ledge, Old Cilley Ledge to Marshall Pt.
9	1			Penobscot River (Fort Pt. → Wilson Pt.)
9	2			Passagassawakeag River (Moose Pt. → Browns Head)
10				Muscongus Bay → Pemaquid Pt.
10	1			St. George River (Howard Pt.)
10	2			Meadowmac River (Bremen Long I., Hungary I.)
11				Johns Bay (Damariscotta R.) → Ocean Pt.
12				Booth Bay → The Cuckolds
13				Sheepscot Bay → Griffith Head
14				Kennebec R. - Merrymeeting Bay → Fuller Rk - Small Pt.
14	1			Kennebec River (Abagadasset Pt.)
14	2			Androscoggin River (Cooks Corner)
15				Casco Bay → Cape Elizabeth
15	1			Portland Harbor Prince Pt. → Portland Head

Primary	2	3	4	5	6	
16						Saco Bay → Biddeford Pool
17						Goosefare Bay → Cape Porpoise
18						Wells-Ogunquit → Cape Neddick
19						York R. → Stones Rock
20						Portsmouth Hbr. → Fairhill Manor
21						N. H. South Coast → Mass. Line
22						Merrimack - Ipswich Bay → Halibut Pt.
22	1					Merrimack R.
22	2					Plum Island Sound
22	3					Essex Bay
22	4					Annisquam R.
23						Cape Ann Halibut Pt.→ Eastern Pt.
24						Gloucester Hbr. → Coolidge Pt.
25						Salem, Marblehead, Nahant Bay → East Pt. (Nahant)
26						Broad Sound (Boston) → Pt. Allerton
26	1					Boston-Hull Bay Deer Island-Pt. Allerton
26	1	1				Dorchester Bay Castle I.→ Governors I. and Long I. → Deer I.
26	1	1	1			Boston Inner Harbor Charles R. dam; Mystic R. & Chelsea R. Bridge and Castle I.→ Governors I.

Primary	2	3	4	5	6	
26	1	2				Quincy Bay Long I. → Deer I. and Nut I. → Peddocks I. Windmill Pt.
26	1	3				Weymouth-Hingham-Hull Bay Nut I. → Peddocks I. → Windmill Pt.
27						Cohasset Hbr. → Cedar Point
28						New Inlet (North River) → Brant Rock
29						Plymouth Bay → Manomet Pt.
30						Cape Cod Bay → Race Pt.
30	1					Center Hill (Manomet Pt. ---→ Peaked Cliff)
30	2					Cape Cod Canal (E. of Sagamore Bridge) → Scorton Neck
30	3					Barnstable Harbor Scorton Neck → Nobscusset Pt.
30	4					Wellfleet Harbor → Jeremy Pt.
30	5					Provincetown Harbor → Race Pt.
31						Outer Cape Cod → S. end Nauset Beach I.
31	1					Nauset Harbor
31	2					Chatham Harbor
32						Nantucket Sound S. end Nauset I. → Nomans Land → Cuttyhunk
32	1					Harwich SW Chatham Harbor I. → Pt. Gammon
32	2					Hyannis, Centerville, Cotuit → Succonnesset Pt.

Primary	2	3	4	5	6	
32	3					Falmouth - Woods Hole Nonamesset I.
32	4					Elizabeth Islands (SE)
32	5					Martha's Vineyard
32	6					Nantucket Island
32	7					Monomoy Island
33						Buzzards Bay →Quicksand Pt. (R. I. Line)
33	1					Elizabeth Islands (NW) Cuttyhunk Lite - - Mink Pt. (Nonamesset I.)
33	2					West Barnstable Coast Penzeance Pt. —→ Wings Neck Lite
33	3					SW Cape Cod Canal →Stony Pt. dike lite and Sagamore bridge
33	4					Wareham Bay —→ Bird I. & Butler Pt.
33	5					South Plymouth Coast —→ Rocky Pt. (West I.)
33	6					New Bedford Bay —→ Mishaum Pt.
33	7					Slocums R. Bay →Goosebury Neck
33	8					Horseneck Bay —→ Rhode Island State Line
34						Narragansett Bay →Pt. Judith
34	1					SE Rhode Island Coast Mass. line (Quicksand Pt.) →Sakonnet Pt.
34	2					Sakonnet River →Sachuest Pt. and The Hummocks bridge
34	3					Newport South Shore Sachuest Pt. →Brenton Pt.

Primary	2	3	4	5	6	
34	4					Narragansett East Passage -Beavertail Pt. and Warwick Pt. -> Patience I. Prudence I. —> Conanicut Pt.
34	4	1				Mt. Hope Bay - Taunton R. Mt. Hope & The Hummocks bridges
34	4	2				Providence R. Conimicut Pt. - Nayatt Pt.
34	5					Narragansett West Passage Beavertail Pt. —> The Narrows (East Pt.)
34	6					East Pt. Judith Coast —>Pt. Judith
35						Long Island - Block I. Sound —> Old Harbor Pt. (Block I.) to Montauk Pt. and Throgs Neck Bridge
35	1					Rhode Island Coast
35	2					Fishers Island Sound
35	3					Thames R.
35	4					Niantic Bay Black Pt. -> Goshen Pt.
35	5					Connecticut R. -> Kelsey Pt.
35	6					Guilford Coast -> Indian Neck
35	7					New Haven Harbor —> Pond Pt.
35	8					Housatonic R. —> Stratford Pt.
35	9					Bridgeport —> Shoal Pt. (Penfield Reef)
35	10					Saugatuck R. - Norwalk -> Long Neck Pt.
35	11					Port Chester - Stamford -> Peningo Pt.

Primary	2	3	4	5	6	
35	12					West L. I. Sound → Sands Pt. - Execution Rocks
35	12	1				Little Neck Bay Elm → Willetts Pt.
35	12	2				Manhasset Bay Hewlett → Barker Pt.
35	13					Hempstead Harbor → Matinicock Pt.
35	14					Oyster Bay → Lloyd Pt.
35	15					Huntington Bay → Eatons Neck Pt.
35	16					Smithtown Bay → Crane Neck Pt.
35	17					Port Jefferson → Miller Place 73° W. Long.
35	18					Northeast Long Island → Orient Pt.
35	19					Gardiners Bay (+ Plum I.) → Montauk Pt.
35	19	1				Gardiners Bay Orient Pt. → Montauk Pt. and Cleaves → Hay Beach Pt. and Mashomack Pt. → Barcelona Neck
35	19	1	1			Shelter I. Sound Cedar Beach Pt. → Jessup Neck
35	19	1	1	1		Little Peconic Bay New Suffolk → Robbins I. → Cow Neck Pt.
35	19	1	1	1	1	Great Peconic Bay
35	20					Block I.
36				N. Y. Bight		(Cape May → Montauk Pt.)
36	1					East Outer L. I. Montauk Pt. → Southampton Lookout Tower
36	1	1				Georgica Pond Inlet

Primary	2	3	4	5	6	
36	1	2				Mecox Pond Inlet
36	2					Shinnecock Bay → Quogue Cupola
36	3					Moriches Bay → Smith Pt. Narrows Bridge
36	4					Great South Bay → Jones Beach State Park Lighted Tower (Great I. br.)
36	5					Western Outer L. I. Jones Beach State Park Twr. → Rockaway Pt. Lite
36	5	1				Jones Inlet
36	5	2				East Rockaway Inlet
36	6					N. Y. Harbor → Sand Hook Lite
36	6	1				Rockaway Inlet - Jamaica Bay
36	6	2				Newtown Creek
36	6	3				Hudson R.
36	6	4				Hackensack R.
36	6	5				Passaic R.
36	6	6				Raritan R.
36	6	7				Shrewsbury R.
36	7					North Jersey Coast → Bay Head
36	7	1				Shark R. Inlet
36	7	2				Manasquan Inlet
36	8					Barnegat Coast → Manahawkin
36	9					Atlantic City Coast → Peck Beach Cup
36	9	1				Beach Haven Inlet Little Egg Inlet

Primary	2	3	4	5	6	
36	9	2				Brigantine Inlet
36	9	3				Absecon Inlet
36	9	4				Great Egg Harbor Inlet
36	10					South Jersey Coast —› Cape May
36	10	1				Corson Inlet
36	10	2				Townsend Inlet
36	10	3				Hereford Inlet
36	10	4				Cape May Inlet
37						Delaware Bay —› Cape Henlopen
37	1					Schuylkill R.
38						Delaware Coast —› Del. - Md. line
38	1					Indian River Bay (SW of Middle I.)
38	1	1				Rehoboth Bay (N. of Middle I.)
MA-1						"North Md. Coast"
MA-1-1						Isle of Wight Bay (Md.)
MA-1-1-1						Little Assawoman Bay (Del.)